GRASSLAND ECOLOGY AND CLASSIFICATION SYMPOSIUM PROCEEDINGS

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POSTER SESSION:
CHARACTERISTICS AND DISTRIBUTION OF CHERNOZEMIC SOILS IN THE ASHCROFT MAP AREA

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INTRODUCTION

The objective of this paper is to describe the topographic and geographic distribution of the Chernozemic great groups and some selected subgroups within the Ashcroft map area. Chernozemic soils are not extensive within British Columbia; the Ashcroft map area (National Topographic Series 92-I) contains the highest proportion of Chernozems compared to any other map area of similar scale within the province (Valentine et al. 1978). Much of the research on Chernozems has been carried out within this area by the staff of the Agriculture Research Station at Kamloops.

Within the Ashcroft map area there is a general trend, at the great group level of the Canadian System of Soil Classification (Canada Soil Survey Committee 1978), for Chernozems to change from Brown, to Dark Brown, to Black with increasing elevation. Six subgroups within these great groups occur: Orthic Brown (O.B), Rego Brown (R.B), Orthic Dark Brown (O.D.B), Solonetzic Dark Brown (SZ.D.B), Orthic Black (O.B), and Calcareous Black (CA.B).

SOURCES OF DATA AND PROCEDURES

The first major study of grasslands and grassland soils in the Ashcroft area was carried out by Tisdale (1947). In that paper the author recognized three elevational zones; the Lower, Middle and Upper Grasslands, which are characterized by Brown, Dark Brown, and Black Chernozemic soils respectively. A study by van Ryswyk et al. (1966) showed

the relationships between climate, vegetation and grassland soils at different elevations. These studies have provided the basic framework for the Chernozemic portion of the soil legend and the definition of soil associations for soil mapping in the Ashcroft area (Young 1978).

Twenty-three soil associations describe the areas which have dominantly Chernozemic soil profiles (Young 1978). A soil association is a group of relatively homogeneous soils developed on similar parent materials under similar climatic conditions. Soils grouped together in a soil association can be expected to have similar productivity and respond in a similar way to various types of land management practices.

This paper is derived mainly from information contained in the Ashcroft soils report (Young and Fenger in preparation) and is structured according to the zonal framework outlined by Tisdale (1947). Thirty-six Chernozemic profiles were described during the Ashcroft soil survey and are used to summarize the characteristics of the great groups fo this area (B.C. Min. Environ. unpublished data*).

Grassland soils and associated grassland vegetation have been the subject of several other studies in the Ashcroft map area including those of Spilsbury and Tisdale (1944), Weir (1955), McLean and Marchand (1968), Lord and McLean (1969), Watson (1977), and Jakoy (1981).

CHERNOZEMS WITHIN THE LANDSCAPE

The diagnostic criterion for a Chernozemic soil is the presence of an A horizon, in

*Soil profiles from within the Ashcroft map area are stored within the B.C. Soil Information System file and are available on request from the Survey and Resource Mapping Branch, British Columbia Ministry of Environment, Victoria, B.C.

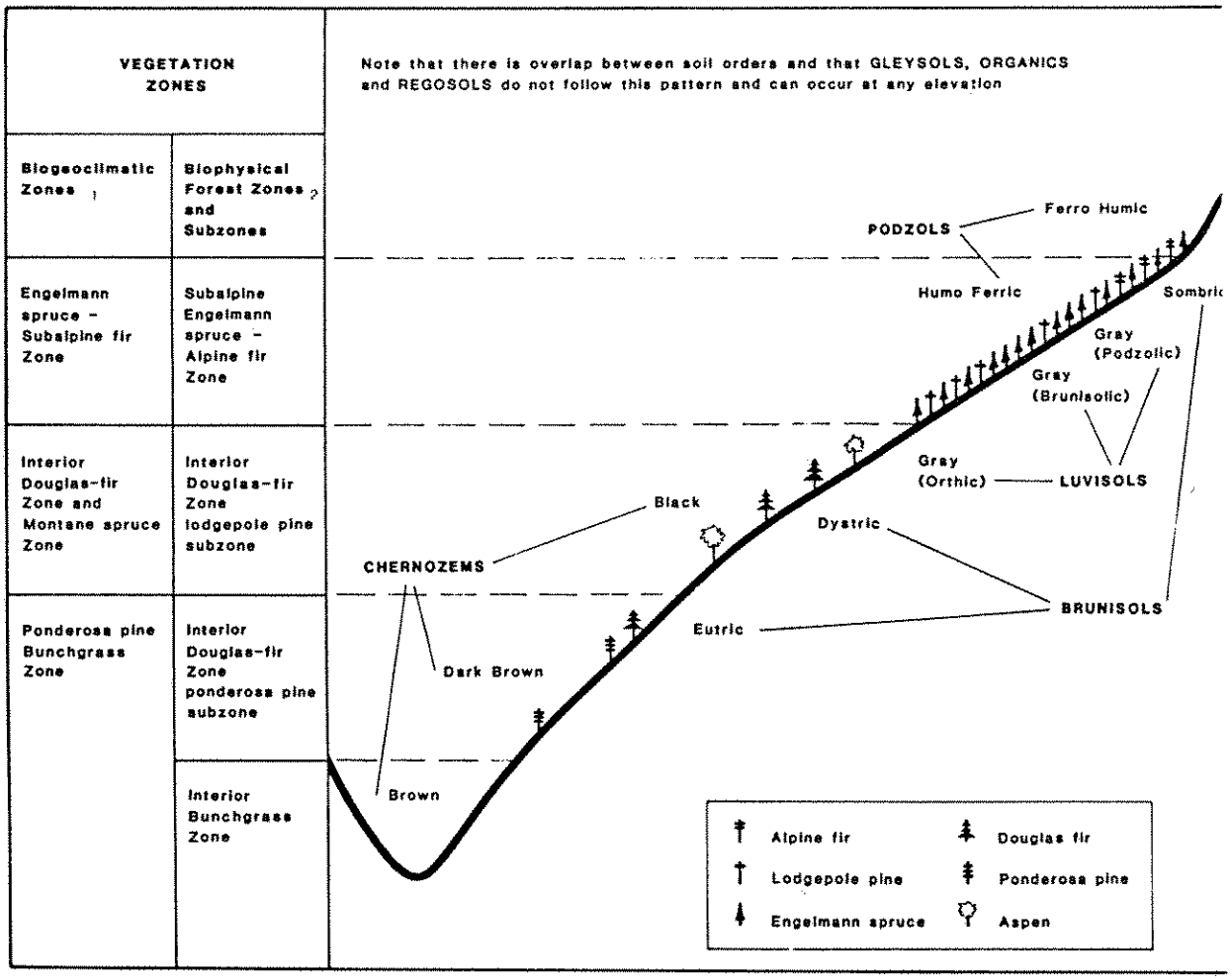
which organic matter has accumulated. The requirements of a chernozemic A horizon are defined by the Canada Soil Survey Committee (1978) and summarized by Green and van Ryswyk (this publication).

Figure 1 shows the general elevational distribution of taxonomic soil orders and great groups in the map area, and Figure 2 shows the geographic distribution of the Chernozemic subgroups. The Orthic subgroups of the Brown, Dark Brown and Black great groups are the most extensive and occur as the dominant or modal soil for most soil associations. The Rego, Solonetzic and Calcareous subgroups are less extensive; each are dominant in one soil association.

THE BROWN CHERNOZEMIC GREAT GROUP

Brown Chernozems are differentiated from other great groups by colour, as their name implies. They must have a chernozemic A which has a Munsell (1975) colour value darker than 3.5 moist and 4.5 to 5.5 dry and a chroma which is usually darker than 1.5 (Canada Soil Survey Committee 1978). The Brown Chernozemic soil climate is typically cold and subarid (Clayton et al. 1977). These soils are restricted to the lower elevations along the major valleys of the Thompson and Fraser rivers. Associated with these soils, Tisdale (1947) delineated a "Lower Grassland Zone" characterized by Agropyron spicatum and Artemisia tridentata. This zone was also recognized by van Ryswyk et al. (1966) as the Artemisia tridentata zone.

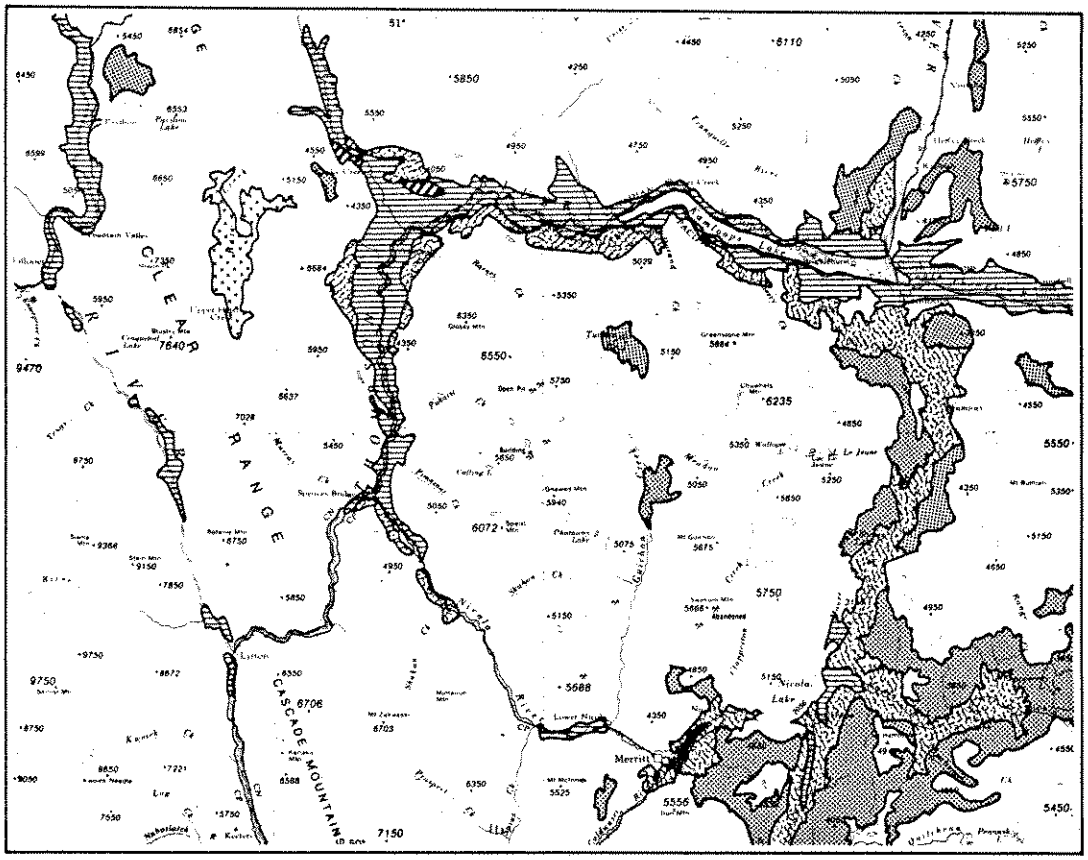
The profile development of the Brown Chernozems within the map area typically consists of a thin A horizon which is often restricted to a fine capping of aeolian materials. The nine profiles sampled within this great group were between 335 and 525 m in elevation with an average of 420 m. The A horizons of the profiles ranged from 10 to 30 cm in depth with an average of 17 cm, and organic carbon content ranged from 1.0 to



1 after Krajina (1969) and Mitchell and Green (1981)

2 after van Barneveld (1977), described in Young and Fenger (in preparation)

Figure 1. Schematic diagram showing the general trend in soil great groups with increasing elevation within the Ashcroft map area.



Map Symbol	Subgroup	Great Group	Soil Association
	Rego	Brown	Cache Creek
	Orthic	Brown	Carabine, Courtenay, Flat Creek, Godey, Lundbum, Shumway, McKnight, Tranquille
	Solonetzic	Dark Brown	Lac du Bois
	Orthic	Dark Brown	Soues, Glimpse, McQueen, Commonage, Laluwissen, Trapp Lake
	Calcareous	Black	Medicine
	Orthic	Black	Aymer, Gwenn, Meander, Mossey, Trachyte, Tulle

Figure 2. Soils legend for distribution of Chernozemic subgroups of the Ashcroft Map Sheet, 92-I.

1.9% with an average of 1.3% (B.C. Min. Environ. unpublished data). B horizons were also thin; carbonates had only leached to a depth of 10 to 30 cm before precipitating to form a carbonate enriched horizon.

Figure 3 shows the nine soil associations dominated by soils of the Brown Chernozemic great group. The subgroup classification, parent materials and dominant bedrock types pertaining to these soil associations are also shown. Table 1 summarizes the texture, drainage, and geographic distribution of the five most extensive soil associations.

Table 1. Characteristics and distribution of the most extensive soil associations (of the Ashcroft map area [92-I]) with dominantly Brown Chernozemic development

ASSOCIATION	TEXTURE	DRAINAGE	DISTRIBUTION
Courtenay	sandy loam to loam	well	Thompson River between Savona and Spences Bridge
McKnight	loam to silty loam	well	near Ashcroft and south towards Spences Bridge, south aspects along South Thompson River and north of Kamloops
Godey	sandy loam to loam	rapid	Lytton to Lillooet and Ashcroft to Kamloops
Lundbom	silty clay loam to clay loam	well	along South Thompson River
Cache Creek	sandy loam to loam	well	Semlin and Bonaparte valleys

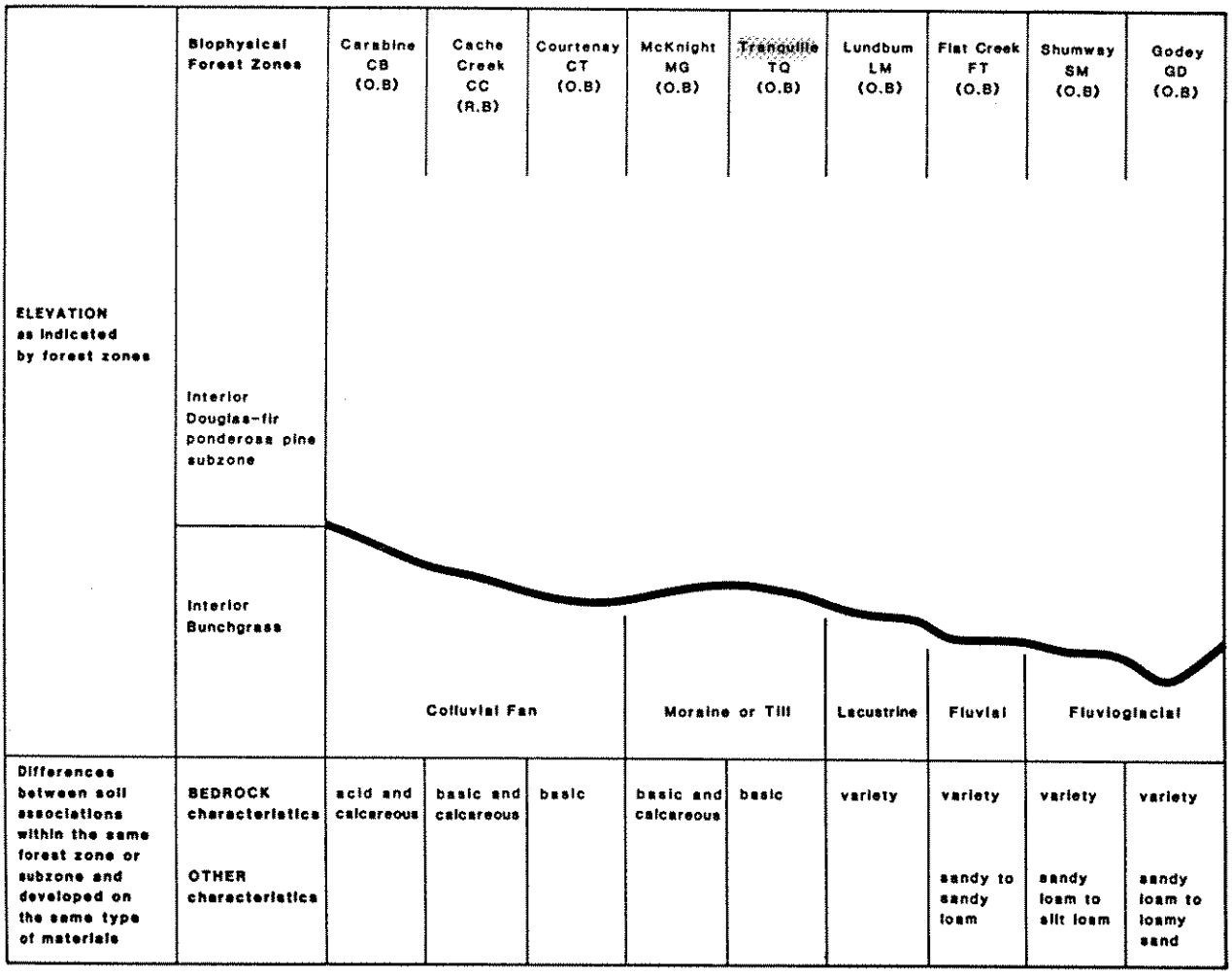


Figure 3. Brown Chernozemic soil associations of the Ashcroft map area (92-I).

THE DARK BROWN CHERNOZEMIC GREAT GROUP

Dark Brown Chernozems have an A horizon somewhat darker than the Brown great group with Munsell (1975) colour values darker than 3.5 moist and 3.5 to 4.5 dry and a chroma usually greater than 1.5 dry (Canada Soil Survey Committee 1978). The Dark Brown soil climate is typically cold and semi-arid (Clayton et al. 1977). Associated with the area of Dark Brown Chernozemic soils Tisdale (1947) classified a "Middle Grassland Zone" characterized by Agropyron spicatum and Poa sandbergii. This zone was also recognized by van Ryswyk et al. (1966) but described by a Stipa comata and Poa sandbergii grassland community.

The Dark Brown Chernozemic soil profile is typically thicker and better expressed than profiles described within the Brown great group. The nine profiles sampled within this great group ranged in elevation from 350 to 930 m with an average of 600 m; A horizons ranged from 10 to 34 cm with an average of 19 cm and organic carbon content ranged from 1.2 to 3.8% with an average of 2.3% (B.C. Min. Environ. unpublished data).

Figure 4 shows the seven soil associations dominated by soils of the Dark Brown Chernozemic great group; the subgroup classification, parent materials and dominant bedrock types are also illustrated. Table 2 summarizes the texture, drainage and geographic distribution of the most extensive soil associations shown in Figure 4. The Dark Brown great group occurs intermittently above the Brown great group along the Thompson River and south of Kamloops to Nicola Lake at the lowest elevation of the Thompson Plateau (Figure 2).

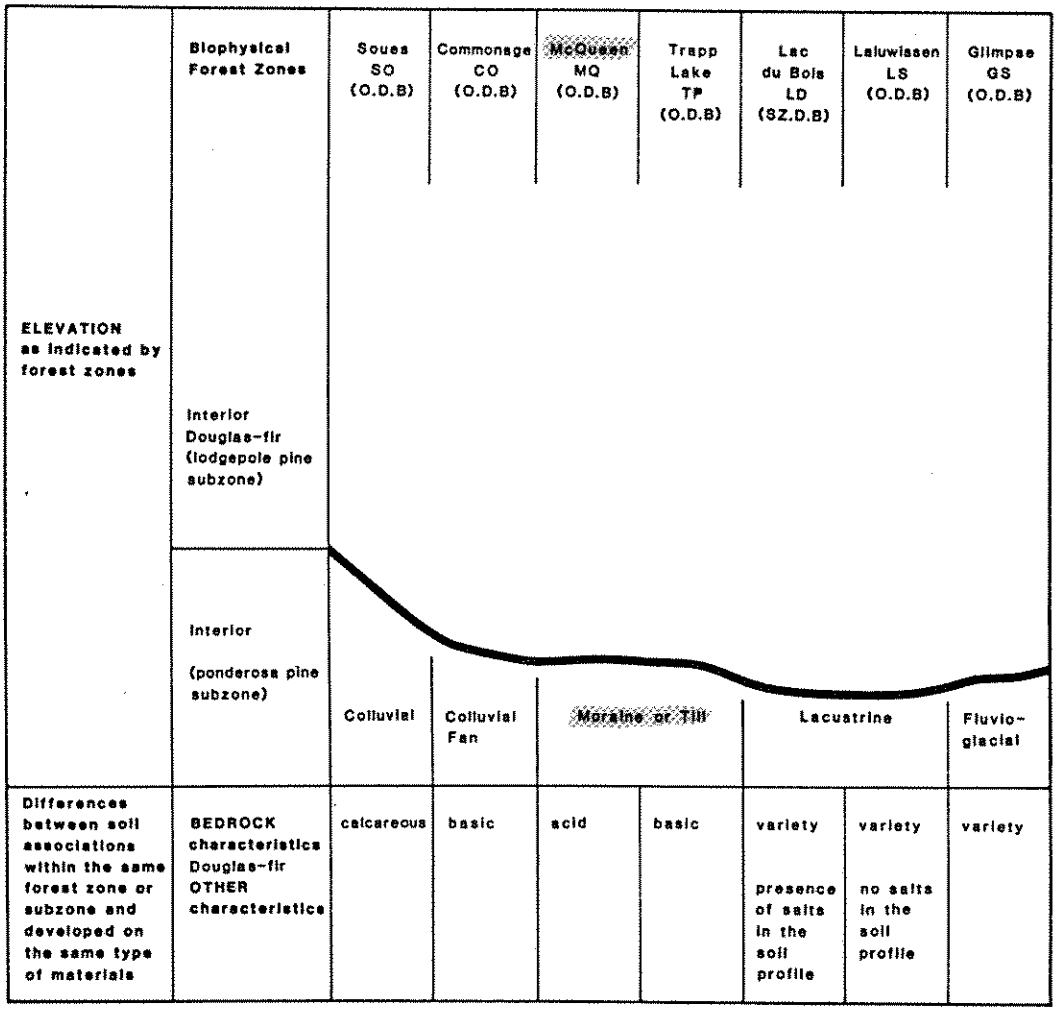


Figure 4. Dark Brown Chernozemic soil associations of the Ashcroft map area (92-I).

Table 2. Characteristics and distribution of the most extensive soil associations with dominantly Dark Brown Chernozemic development

ASSOCIATION	TEXTURE	DRAINAGE	DISTRIBUTION
Glimpse	sandy to loamy sand	rapid	extensive; concentrations in area bounded by Knutsford, Trapp and Napier lakes, also in area bounded by Nicola, Douglas and Minnie lakes.
Lac du Bois (weakly saline)	silty clay loam to loam	well	limited distribution, near Merritt and Nicola Lake
McQueen	silty loam to silty clay loam	well	north and south of Kamloops and north of Ashcroft
Trapp Lake	silty loam to silty clay loam	well	scattered units within an area bounded by Ashcroft, Savona, Knutsford and Douglas Lake

THE BLACK CHERNOZEMIC GREAT GROUP

The A horizon of the Black Chernozems is the darkest of the three great groups discussed, with Munsell (1975) colour values darker than 3.5 dry and chroma usually 1.5 (less moist (Canada Soil Survey Committee 1978). The Black Chernozemic soil climate i typically cold and subhumid (Clayton et al. 1977). Black Chernozemic soils are most extensive east of Merritt and are situated away from the major river valleys on the undulating surface of the Thompson Plateau.

Associated with the area of Black Chernozemic soils Tisdale (1947) delineated an "Upper Grassland Zone" dominated by Agropyron spicatum and Festuca scabrella. This zone, characterized by Festuca scabrella, was also recognized by van Ryswyk et al.

(1966) who further subdivided it into an upper and lower portion based on differences in elevation, plant species present, April to October mean temperature and the amount of organic carbon present within the upper 2 dm of the solum.

The Black Chernozemic soil profiles have the thickest and most well developed A horizons. The 18 profiles sampled ranged in elevation from 880 to 1220 m with an average of 1050 m; A horizons ranged from 10 to 35 cm in thickness with an average of 21 cm and organic carbon content ranged from 2.1 to 5.7% with an average of 3.2% (B.C. Min. Environ. unpublished data).

Figure 5 shows the seven dominant Black Chernozemic soil associations and the subgroup classification, parent materials and dominant bedrock types pertaining to them. Table 3 summarizes the texture, drainage, and geographic distribution of the most extensive soil associations shown in Figure 5.

Table 3. Characteristics and distribution of the most extensive soil associations with dominantly Black Chernozemic development

ASSOCIATION	TEXTURE	DRAINAGE	DISTRIBUTION
Mossey	loam to silty loam	well	North Thompson River Valley south of Kamloops and west of Cache Creek
Trachyte	silty loam to silty clay loam	well	east and south of Nicola Lake
Tullee	silty loam to silty clay loam	well	near Douglas and Minnie lakes

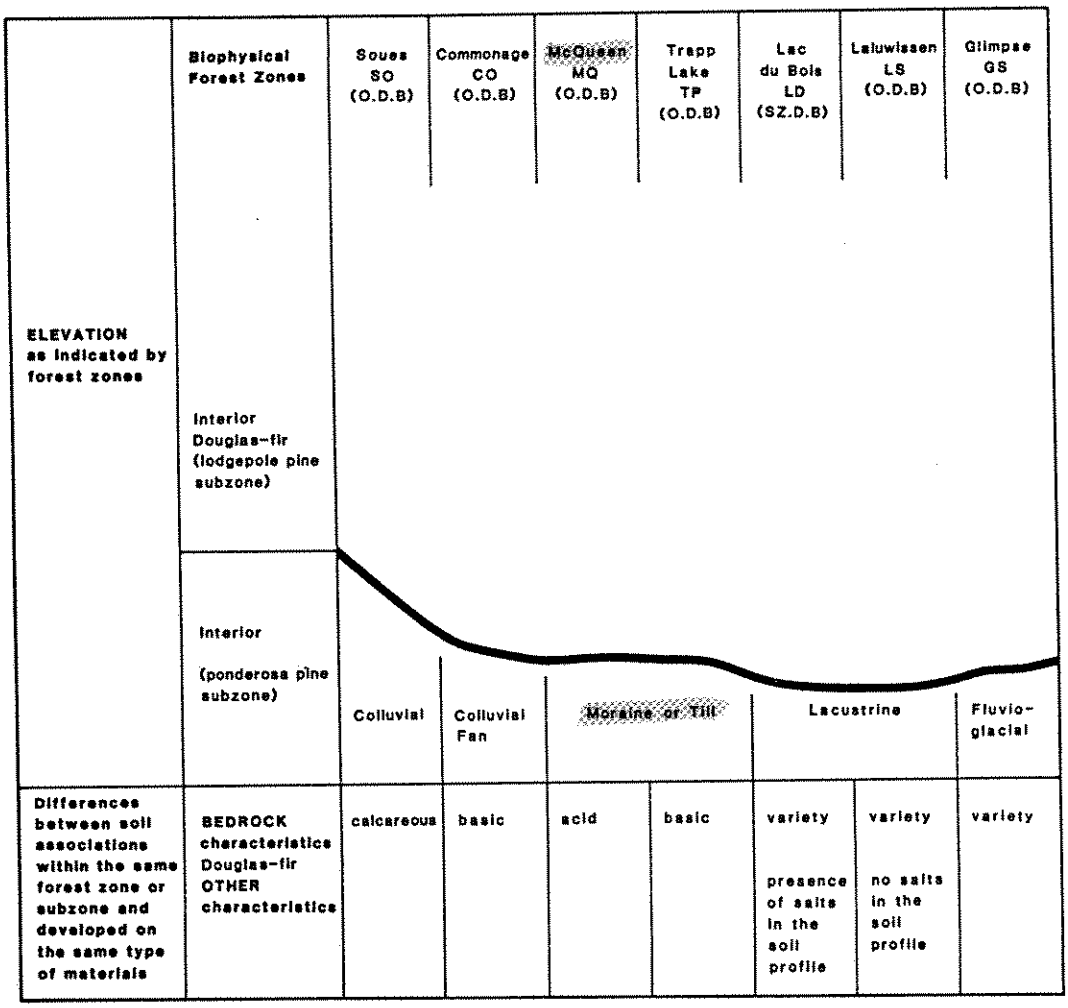


Figure 5. Black Chernozemic soil associations of the Ashcroft map area, (92-I).

SUMMARY

The Ashcroft map area (National Topographic Series 92-I) contains the highest proportion of Chernozemic soils of any map area within British Columbia. Within this

area there is a general trend, at the great group level of the Canadian System of Soil Classification, for Chernozems to change from Brown, to Dark Brown, to Black with increasing elevation. This corresponds to an increase in the thickness and amount of organic carbon within the A horizons with increasing elevation.

Below the great group level six subgroups occur: Orthic Brown, Rego Brown, Orthic Dark Brown, Solonetzic Dark Brown, Orthic Black and Calcareous Black. Descriptions of the characteristics and distribution of the Chernozemic soil associations of the Ashcroft Map area provided here can assist in extrapolation of research findings leading to improved understanding and management of grasslands.

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